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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/914,306	07/16/2002	Young Suk Lee	5204-22	2394

7590 12/18/2002

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EXAMINER

CROWELL, ANNA M

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 12/18/2002

4

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/914,306

Applicant(s)

LEE ET AL

Examiner

Michelle Crowell

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

*Detailed Action*

*Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 3-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 3 recites the limitation, "containing **less amount of hydrogen** when using hydrogen containing plasma to form said  $\text{Si}_x\text{N}_y$  thin film" which is indefinite. It is unclear what "less amount of hydrogen" means. How is hydrogen being compared? There is no value or element disclosed to compare hydrogen. How much is less? What is the value of less?

4. Claim 5 recites the limitation, "containing **less amount of hydrogen** when using hydrogen containing plasma to form DLC thin film or SiC thin film" which is indefinite. It is unclear what "less amount of hydrogen" means. How is hydrogen being compared? There is no value or element disclosed to compare hydrogen. How much is less? What is the value of less?

5. Claim 5 recites the limitation " said DLC thin film or SiC thin film" in page 8, line 9. There is insufficient antecedent basis for this limitation in the claim.

*Claim Rejections - 35 USC § 103*

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (U.S. 6,287,981) in view of Kosaki et al. (U.S. 6,033,540).

Referring to Figure 8 and column 6, lines 24-52, Kim discloses a plasma processing apparatus comprising a dome shaped process chamber 120, a gas supply line 130 (inlet), a vacuum line 128 (outlet), a lower electrode 124 (susceptor), and a dome shaped upper electrode 123. Wafer 126 is disposed on the lower electrode 124.

Kim fails to teach an opening cut horizontally in the upper polar part of the electrode.

Referring to Figure 1a, 2a, 2b, 3, and column 4, line 45 – column 5, line 26, Kosaki teaches a mesh anode electrode 14 with a central aperture 14a (opening). The mesh anode electrode has an aperture in the center to provide an electric field density distribution that is lower in the central portion of the wafer than in the portion along the edge. As seen in Figure 3, the diameter of the aperture size is from 40-80 mm. In addition, uniform coating thickness increases with size of the aperture (col. 5, lines 22-26). Therefore by providing an aperture size between 40-80 mm in the electrode, an uniform film thickness is achieved. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the upper

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electrode of Kim with the aperture as taught by Kosaki. Hence, uniform film thickness is achieved.

8. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (U.S. 6,287,981) in view of Kosaki et al. (U.S. 6,033,540) as applied to claims 1 and 2 above, and further in view of Pang et al. (U.S. 6,193,802), Takagi et al (U.S. 4,539,068), and Ong et al. (U.S. 5,645,900).

Kim in view of Kosaki fails to teach an RF power of 500 W to 1000 W and gases  $\text{SiH}_4$  and  $\text{NH}_3$  to form a  $\text{Si}_x\text{N}_y$  thin film,  $\text{CH}_4$  and  $\text{H}_2$  to form a DLC thin film, and  $\text{SiH}_4$ ,  $\text{CH}_4$ , and  $\text{H}_2$  to form a SiC thin film..

Referring to column 13, lines 1-13, Pang teaches that it is known to provide an RF power supply 102 at a power level of between 50-2000 W to cathode 58 (electrode). The power level must be high enough to form intense plasma and low enough to save energy costs. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the electrode of Kim in view of Kosaki with the power level between 50-2000 W. This would provide a power level high enough to form intense plasma.

Referring to Figure 3 and column 3, line 64-column 4, line 21, Takagi teaches that it is known to react  $\text{SiH}_4$  and  $\text{NH}_3$  to form a silicon nitride film ( $\text{Si}_x\text{N}_y$  thin film). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Kim in view of Kosaki. These are known gases used to form silicon nitride thin films.

Referring to column 6, line 35 – column 7, line 6, and line 30 and 47, Ong teaches that it is known react  $\text{CH}_4$  and  $\text{H}_2$  to form a DLC thin film and to mix  $\text{SiH}_4$ ,  $\text{CH}_4$ , and  $\text{H}_2$  to form a SiC

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thin film. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Kim in view of Kosaki. These are known gases used to form a DLC thin film and a SiC thin film.

### *Conclusion*


9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (703) 305-1956. The examiner can normally be reached on M-F (8:00 - 4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

AMC *amc*  
December 9, 2002

  
GREGORY MILLS  
SUPERVISORY PATENT EXAMINER  
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